Ventilation, smoke control and Active Desmoking

Lesson Topic 3.6

Enabling objectives

1. Identify the different types of ventilation
- State and discuss ventilation procedures
- Identify air moving devices, both installed and portable
- Select the appropriate procedures to actively desmoke the inner smoke boundary and the outer smoke boundary

Enabling objectives

- Describe the organization required to actively desmoke the inner smoke boundary and the outer smoke boundary
- Describe the techniques to actively desmoke the inner smoke boundary and the outer smoke boundary

Ventilation

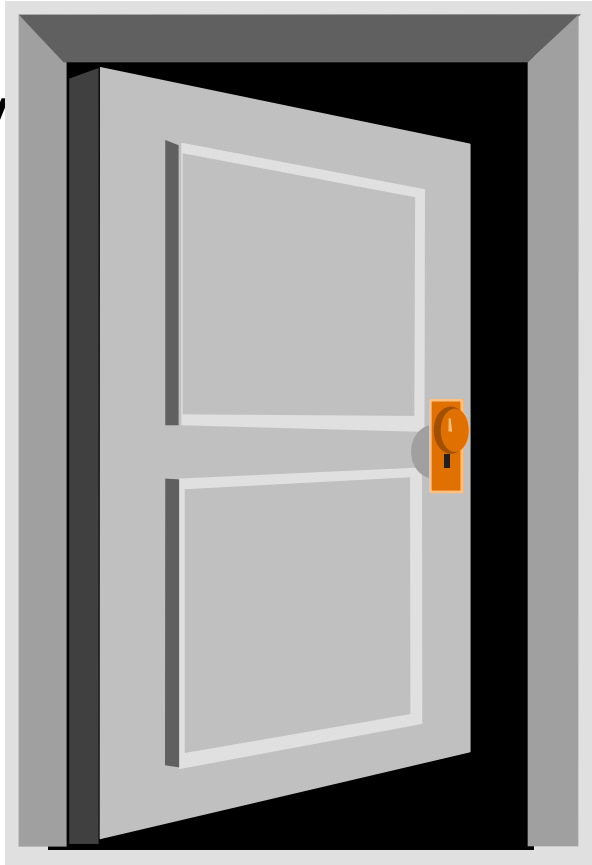
- Introduction & movement of fresh air into a space to remove contaminated air or to control the temperature
- Required for
  - Cleaning
  - Oxygen deficient
  - Explosive
  - Toxic
  - After fires
  - Routine movement of air aboard ships

Types of Ventilation

- General ventilation
  - Supply or exhaust which brings about one complete air change every 3 minutes
- Supply ventilation
  - Moving fresh air into a space and displacing contaminated air

Types of Ventilation

- Exhaust ventilation
  - Less efficient than supply
  - Better for control and removal of contaminants
- Natural Ventilation
  - Open door or window
  - Catches the wind



Ventilation

- Combined or net effect of ventilation
  - Only the net effect is considered
  - Net exhaust is preferable
  - Removes the source of contamination at its highest concentrations
  - Will not contaminate adjoining space
  - Exhaust to the outside atmosphere should be downwind

Air moving devices, Installed or fixed systems

- Can be used with restrictions
  - Chief Engineers permission
  - All ducting is inspected
  - Does not discharge into another space
  - Spreads contamination to adjoining spaces

Portable ventilation equipment

- Super Vac, (box fan)
  - Axial flow medium capacity electric fan
  - Rated at 3200 CFM
  - Explosion proof motor
  - 115 volt AC motor, 50 foot cord
  - Lightweight - 52 pounds

Ventilation

- Super vac accessories
  - Door Bar, Extends from 27" to 40”
  - Hanger Strap, Set of 2

Super Vac/Box fan

Portable ventilation equipment

- Ram Fan 2000
  - Operated by pressurized water
  - Lightweight - 35 lbs.
  - 2000 CFM
  - Explosion proof
  - 8 or 10 inch diameter non-collapsible ducting
- Accessories
  - Multiplier
  - Mister

Ram fan 2000

Fan location

- Exhaust fans/blowers shall be located on the weather deck
- Locating fans or blowers at the exhaust inlet would result in a positive pressure on exhaust ducts potential leakage of flammable or toxic atmosphere into other ship spaces

Duct work

- Ductwork is necessary in most ventilation systems to direct and contain the supplied or exhausted air
- Keep duct work as short as possible
- Types of ductwork
  - Non-collapsible ducting, (elephant trunk)

General considerations in selecting a fan

- Volume of air to be moved
- Type of material handled - abrasive, etc
- Potential explosive or fire hazard
- Space available
- Operating temperature
- Efficiency

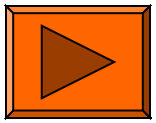
General considerations in selecting a fan

- Type and motive power available
  - Air
  - Water
  - Electrical
- Maintenance
  - Inspections should be made on a planned schedule to check operation of equipment

Calculating the rate of exhaust and supply air

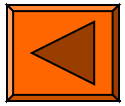
- Formula
  - Shows the requirement for one air change
  - Take the volume of the space in cubic feet and divide it by the rated CFM of the fan
  - Result will be the amount of time required to ventilate the space 1 air change

Example



- Space measurements is 10' X 15' X 15’ = 2250 Cubic ft
- Capacity of the blower is 2000 CFM (RAM FAN)
- Take the volume of the space & divide it by the capacity of the blower (2250 / 2000 = 1.13)
- 1.13 is the number of minutes it would take to ventilate the space (1 complete air change)
- Does it meet general ventilation requirements?
- Yes, one 2000-CFM blower would be used to have one air change every 3 minutes

Example problem



- Space cubic ft 7850
- blower capacity - 2000 CFM
- How many minutes to ventilate space?
- Answer 3.9 minutes
- Does it meet general ventilation requirements?
- No, Then divide 3.9 minutes by 3
- Answer 1.3, round up to next hole number
- 2 blowers are required to meet standards

Active Desmoking

- Removing smoke & heat from the smoke control zone between the inner & outer smoke boundary prior to extinguishing the fire
  - Not required for all fires
  - Used at the discretion of the scene leader
- Shall not be used to remove smoke & heat from the fire compartment

Active Desmoking

- Active desmoking should be considered
  - If the initial attack is unsuccessful
  - If it likely that the fire attack will go on for an extended period of time
  - If smoke or heat in spaces beyond the fire space is impeding the attack on the fire

Active Desmoking Organization

- Scene leader will consider the following to determine the need for active desmoking
  - Location of fire
  - All spaces & accesses that lead to the smoke control zone
  - Time required to extinguish the fire verses the time required to rig active desmoking

Active Desmoking Organization

- RPL approves & directs active desmoking
- RPL looks at the big picture & makes a decision based on all information coming from the scene
- RPL looks at manpower
- RPL looks at the complexity of rigging

Active Desmoking Organization (cont)

- Desmoking team implements active desmoking upon RPL decision
- Team requires communications with locker and scene at all times
- Wear OBA/SCBA
- Due to heat stress the desmoking team should not wear FFE coveralls

Active Desmoking Techniques

- Fire & smoke boundaries shall be set prior to active desmoking
- May require breaking conditions Zebra
- Flow path for active desmoking should be in a straight a line as practical
- Make up air & exhaust air should flow in the same direction & shall never cross paths or change directions

Active Desmoking Techniques

- Dead-ended situation, portable ducting will be needed
- Portable ducting will require increased time & manpower
- Portable ducting will have less air flow
- Secured as high as possible

Active Desmoking Techniques

- Duct goes through a smoke curtain, cinch the smoke curtain tightly around the duct
- Smoke curtain should be raised one foot at the bottom to allow make up air to enter
- Should only take two people ten minutes or less to rig

Active Desmoking Techniques

- Longer set up times may not benefit the overall firefighting effort
- Pre planning
- A single active desmoking scheme may provide desmoking plans for other possible fires in several spaces in the same area of the ship

Active Desmoking Techniques

- Order of planning active desmoking
  - Prepare a desmoking flow path
  - Rig portable blower(s)
  - Establish & maintain desmoking

Summary and Review

- Definition of Ventilation
- Types of Ventilation
- Ventilation Procedures
- Air Moving Devices
- Fan types
- Active desmoking